

1 || What is claimed is:

- 2     1. A molding tray for use in making a dental prostheses model from an impression mold
- 3       having formed therein imprints of a patient's teeth, said molding tray comprising;
  - 4           a. an elongated hollow body having a lower surface, a peripheral wall which
  - 5         circumscribes a hollow interior space of said body and protrudes perpendicularly upwardly from
  - 6         said lower surface and which terminates in an upper surface parallel to said lower surface,
  - 7           b. at least one pair of opposed internal flanges disposed between inner facing wall
  - 8         surfaces of said peripheral wall, said flanges having generally flat, co-planar upper surfaces
  - 9         which are parallel to said upper surface of said body, said flanges having between opposed
  - 10       inner facing edges thereof a longitudinally elongated aperture, and forming between upper and
  - 11       lower surfaces of said body and inner wall surfaces of said upstanding peripheral wall of said
  - 12       body, upper and lower wells, respectively.
  - 13           c. openable means for sealing said aperture to thereby form with said flanges a
  - 14       temporary base wall for said upper well which is capable of receiving and holding a liquid cast-
  - 15       forming, molding material such as plaster-of-Paris or liquid die stone,
  - 16           d. a plurality of longitudinally spaced apart protuberances which protrude inwardly
  - 17       from inner surfaces of opposed sides of at least an upper portion of said peripheral wall of said
  - 18       body adjacent to said upper well, said protuberances alternating with grooves formed between
  - 19       said protuberances, and
  - 20           e. whereby liquid die stone is introducible into said upper well and hardened to
  - 21       comprise a base of a dental model cast, said openable means for sealing said flange aperture
  - 22       opened, an upwardly directed force is exerted on said base of said dental model cast to thereby
  - 23       eject said cast from said molding tray, said dental model cast is segmented into individual die
  - 24       segments, selected ones of which optionally have a manipulating pin inserted into bores thereof,
  - 25       and said die segments re-inserted into said upper well of said tray to predetermined horizontal
  - 26       index positions enabled by engagement of said protuberances and grooves of said tray with
  - 27       complementarily shaped grooves and protuberances molded into sides of said bases of said die
  - 28       segments, and to predetermined vertical index positions enabled by abutment of lower surfaces

1 of said die segments with upper surfaces of said flanges, said lower well of said tray being of  
2 sufficient depth to position lower surfaces of said manipulating pins above said lower surface  
3 of said tray.

4 2. The molding tray of Claim 1 wherein said upper and lower wells have approximately equal  
5 depths, measured from said upper surface of said peripheral wall to said upper surfaces of said  
6 flanges, and said lower surface of said peripheral wall to said lower surfaces of said flanges,  
7 respectively.

8 3. The molding tray of Claim 2 wherein said lower well has a shape generally symmetric to  
9 that of said upper well.

10 4. The molding tray of Claim 3 wherein said upstanding perimeter wall is further defined as  
11 including a pair of longitudinally elongated, spaced apart longitudinal parallel wall segments and  
12 at least one transverse end wall segment disposed transversely to said longitudinal wall  
13 segment.

14 5. The molding tray of Claim 4 wherein said longitudinal and transverse end wall segments  
15 comprise a peripheral ring which encircles said upper and lower wells.

16 6. The molding tray of Claim 5 wherein said flanges are further defined as including at least  
17 a first pair of opposed longitudinal flanges which protrude inwardly towards one another from  
18 inner surfaces of longitudinally disposed peripheral wall of said segments, and at least one  
19 transverse flange which protrudes inwardly towards from an inner surface of a transversely  
20 disposed segment of said peripheral wall.

21 7. The molding tray of Claim 6 wherein said openable means for sealing said aperture  
22 bordered by inner facing edge walls of said flanges is further defined as comprising in  
23 combination at least one break-away panel within said aperture which is joined at outer  
24 peripheral edges thereof to inner peripheral edges of said flanges by frangible members.

25 8. The molding tray of Claim 7 wherein said break-away panel is further defined as being  
26 provided with at least one protuberance which protrudes upwardly from an upper surface of said  
27 break-away panel into said upper well, whereby a dental model cast formed from liquid die stone  
28 poured into said well has formed in a base portion of said cast an upwardly protruding

1 indentation having a shape complementary to that of said protuberance, said indentation being  
2 of an appropriate size and shape to serve as a pilot indentation for guiding into said base a point  
3 of a drill bit used to form in said base a bore for receiving a manipulating pin.

4 9. The molding tray of Claim 8 wherein said protuberance is located generally midway  
5 between longitudinally disposed sides of said upper well.

6 10. The molding tray of Claim 9 wherein said protuberance is further defined as being a  
7 longitudinally elongated rib which is parallel to said longitudinally disposed sides of said upper  
8 well.

9 11. The molding tray of Claim 6 wherein said openable means for sealing said aperture  
10 bordered by inner facing edge walls of said flanges is further defined as being an insert  
11 lodgeable in said aperture.

12 12. The molding tray of Claim 11 wherein said insert is further defined as being provided with  
13 at least one protuberance which protrudes upwardly from an upper surface of said insert, said  
14 protuberance protruding upwardly into said upper well when said insert is lodged in said aperture  
15 of said tray, whereby a dental model cast formed from liquid die stone poured into said well has  
16 formed in a base portion of said cast an upwardly protruding indentation having a shape  
17 complementary to that of said protuberance, said indentation being of an appropriate size and  
18 shape to serve as a pilot indentation for guiding into said base a point of a drill bit used to form  
19 in said base a bore for receiving a manipulating pin.

20 13. The molding tray of Claim 12 wherein said protuberance is located generally midway  
21 between longitudinally disposed sides of said upper well.

22 14. The molding tray of Claim 13 wherein said protuberance is further defined as being a  
23 longitudinally elongated rib which is parallel to said longitudinally disposed sides of said upper  
24 well.

25 15. The molding tray of Claim 6 further including at least two abutment flanges, one each of  
26 which protrudes radially outwardly from each of two sides of said peripheral wall of said tray.

27 16. The molding tray of Claim 15 further including releasable attachment means for  
28 releasably attaching said tray to a second of said trays.

1 17. The molding tray of Claim 16 wherein said releasable attachment means is further  
2 defined as comprising in combination a bracket protruding outwardly from a side of said  
3 peripheral wall of said body, and a hinge mechanism means for pivotably coupling said bracket  
4 of said tray to a bracket of a second tray to thereby enable pivotable relative motion between  
5 said trays in a plane perpendicular to upper edge walls of said trays.

6 18. The molding tray of Claim 17 wherein said bracket is further defined as protruding  
7 perpendicularly outwardly from a transversely disposed one of said abutment flanges.

8 19. The molding tray of Claim 1 wherein said protuberances and grooves are disposed  
9 perpendicularly to said upper surface of said elongated hollow body of said tray.

10 20. The molding tray of Claim 19 wherein said grooves have an inverted wedge-shape.

11 21. The molding tray of Claim 20 wherein said protuberances have a triangular shape.

12 22. The molding tray of Claim 21 wherein said grooves are wider than said protuberances.

13 23. The molding tray of Claim 1 wherein said upstanding peripheral wall of said hollow body  
14 has a longitudinally elongated, generally rectangular plan-view shape.

15 24. The molding tray of Claim 1 wherein said peripheral wall of said hollow body has in plan-  
16 view a shape approximating that of a semi-ellipse.

17 25. The molding tray of Claim 24 wherein said upper and lower wells each have in plan-view  
18 the shape of a semi-elliptical sector.

19 26. The molding tray of Claim 25 wherein said peripheral wall includes a generally vertically  
20 disposed, semi-elliptically curved outer longitudinal wall segment, a semi-elliptically curved inner  
21 longitudinal wall segment spaced radially inwardly of and parallel to said outer wall segment, and  
22 a transversely disposed peripheral wall segment which coincides with a minor axis of a semi-  
23 elliptical plan-view trace of said peripheral wall.

24 27. The molding tray of Claim 26 further including a semi-elliptically shaped web section  
25 which joins inner facing vertical surfaces of said transverse and said inner longitudinal wall  
26 segments.

27 28. A device for detaching a break-away panel part of a dental model molding tray from a  
28 hollow body part of said tray which encloses said break-away panel, said break-away panel

1 being located between and parallel to upper and lower surfaces of said body of said molding tray  
2 and being joined by frangible members to horizontally aligned flange walls which protrude  
3 inwardly towards said panel from inner sides of a peripheral wall of said hollow tray body, said  
4 device including;

5       a.     a template comprising a body which includes,

6              (I)    a base

7              (ii)    a peripheral flange wall which protrudes upwardly from said base,

8              (iii)    a recess formed between an upper surface of said base and inner surfaces  
9                 of said peripheral flange wall, said recess being of a proper size and shape  
10              to vertically downwardly receive therein said hollow body of said tray, with  
11              said lower surface of said tray body parallel to and above said upper  
12              surface of said template base, and with outer upstanding surfaces of said  
13              tray perimeter wall adjacent to said inner facing upstanding surfaces of said  
14              peripheral flange wall of said template, and

15              (iv)    at least one rib-shaped lug which protrudes upwardly from said upper  
16              surface of said template base, said lug having a flat upper surface which  
17              is located a greater distance above said upper surface of said template  
18              base than the distance between a lower surface of said break-away panel  
19              and said lower surface of said hollow tray body, whereby said lug supports  
20              said break-away panel to thereby locate said lower surface of said hollow  
21              tray body above said upper surface of said template, and

22        b.     force exerting means for exerting a downwardly directed force on said body of said

23        tray relative to said template, whereby a reaction force is exerted upwardly on said break-away  
24        panel relative to said tray body sufficient to break said frangible members joining said break-  
25        away panel to said flanges.

26       29.    The device of Claim 28 wherein said tray is further defined as having protruding outwardly  
27       from an outer surface of at least a portion of said peripheral wall of said tray body at least a first  
28       abutment flange.

1 30. The device of Claim 29 wherein said force exerting means is further defined as including  
2 a knock-out tool which has a lower abutment flange-contacting member for contacting an upper  
3 surface of said abutment flange of said tray, and an upper anvil surface rigidly coupled to said  
4 flange-contacting member and adapted to receive a downwardly directed impact.

5 31. The device of Claim 28 wherein said recess of said template is further defined as having  
6 a rectangular plan-view shape.

7 32. The device of Claim 28 wherein said recess of said template is further defined as having  
8 in plan-view the shape of a semi-ellipse.

9 33. A drilling alignment fixture for facilitating drilling blind bores for the receipt of manipulating  
10 pins into bases of die segments of a dental model cast contained in a molding tray, said  
11 alignment fixture comprising an elongated body which includes;

12       a.     a base plate which has a generally flat lower surface and a generally flat upper  
13 surface parallel to said lower surface, said upper surface having formed therein an elongated,  
14 shallow recess which is adapted to receive vertically downwardly therein a lower portion of a  
15 molding tray, with a lower surface of said tray supported on said upper surface of said base  
16 plate.

17       b.     a drill guide bushing disposed through said upper and lower surfaces of said base  
18 plate,

19       c.     indexing means for visually aligning a vertical center line of said drill guide bushing  
20 with a selected longitudinal position of a dental model casting contained in said tray said position  
21 corresponding to a desired longitudinal location for drilling a pin bore into said dental model cast,  
22 and

23       d.     means for moving said tray horizontally on said upper surface of said base plate  
24 to thereby align said selected location of said dental model cast with said indexing means and  
25 said drill bit guide bushing.

26 34. The drilling alignment fixture of Claim 33 wherein said indexing means for visually aligning  
27 a vertical center line of said drill bit guide bushing with a selected longitudinal position of a dental  
28 model casting in said tray is further defined as an aperture through said tray located below a

1 void left in said cast by removal of die stone segment which is to have a pin bore drilled in the  
2 base thereof.

3 35. The drilling alignment fixture of Claim 33 wherein said recess in said upper surface of  
4 said base plate is further defined as being a generally rectangular shaped channel which is  
5 adapted to longitudinally slidably receive a rectangular shaped dental modeling tray.

6 36. The drilling alignment fixture of Claim 33 wherein said base plate is further defined as  
7 having a plan-view perimeter shaped generally like a semi-ellipse.

8 37. The drilling alignment fixture of Claim 36 wherein said recess in said upper surface of  
9 said base plate is further defined as having a generally semi-elliptical plan-view shape of the  
10 proper size and shape to vertically downwardly receive therein a semi-elliptically shaped tray,  
11 with said upper surface of said base plate supporting a lower surface of said tray.

12 38. The drilling alignment fixture of Claim 37 wherein said base plate is further defined as  
13 having through its thickness dimension a semi-elliptical sector-shaped aperture which has an  
14 outer semi-elliptically shaped wall located radially inwardly of and generally parallel to a  
15 perimeter of said base plate, and an inner semi-elliptically shaped wall located radially inwardly  
16 of and generally parallel to said outer aperture wall, said aperture orbitally holding said drill bit  
17 guide bushing.

18 39. The drilling alignment fixture of Claim 38 further including a radially disposed arm which  
19 has an inner radial end portion pivotably fastened to a lower surface of said base plate, an outer  
20 radial portion which includes indexing means for aligning said arm with a selected  
21 circumferential portion of said perimeter wall of said base plate, and an intermediate portion  
22 which has therethrough a bore which receives therein a lower portion of said drill bit guide  
23 bushing.

24 40. The drilling alignment fixture of Claim 37 wherein said indexing means is further defined  
25 as including a pointed end portion of said arm which is radially aligned with said center line of  
26 said drill bit guide bushing and which protrudes radially outwardly of said base plate.

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1      41. The drilling alignment fixture of Claim 40 wherein said indexing means if further defined  
2      as a gnomon which protrudes perpendicularly upwardly from said pointed end portion of said  
3      arm, in radial alignment with said center line of said drill bit guide bushing.

4      42. A slide receptacle for releasably holding a full-arch dental model tray and cast and  
5      attaching the receptacle to an arm of an articulator apparatus, said slide receptacle comprising;  
6            a. a base plate,  
7            b. means for releasably attaching a dental model tray containing a dental model cast  
8      to said base plate,  
9            c. means for releasably attaching said base plate to an arm of an articulator  
10     apparatus, and  
11            d. whereby said dental model cast is repeatedly fixable in a pre-determined position  
12     on said articulator arm for occlusal relationship to an opposing arch, without requiring application  
13     of plaster or other attachment means to said tray, and whereby said tray is removable from said  
14     receptacle and connectable via hinge coupling means to comprise with an opposing dental  
15     model cast in an opposing tray an articulatable full-mouth dental model not requiring use of said  
16     articulator apparatus.

17     43. The slide receptacle of Claim 42 wherein said means for releasably attaching a dental  
18     model tray to said base plate is further defined as comprising in combination;  
19            a. a horizontally disposed abutment flange which protrudes from a perimeter wall of  
20     said base plate of said tray, and  
21            b. means attached to said base plate for frictionally engaging said abutment flange  
22     in response to sliding lower surface of said tray on an upper surface of said base plate.

23     44. The slide receptacle of Claim 43 wherein at least a portion of said base plate thereof is  
24     further defined as having a semi-elliptical shape.

25     45. The slide receptacle of Claim 44 further including a plurality of indexing members which  
26     protrude downwardly from a lower surface of said base plate.

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1      46. The slide receptacle of Claim 45 wherein said means for releasably attaching said base  
2 plate to an arm of said articulator apparatus is further defined as including a ferromagnetic  
3 member recessed in a said lower surface of said base plate.

4      47. The slide receptacle of Claim 46 wherein said releasable attachment means is further  
5 defined as a magnetic member attachable to said arm of said articulator apparatus.

6      48. A method for manipulating a pair of opposed dental model casts held in separate dental  
7 model trays comprising the steps of:

8            a. providing a separate receptacle for each of a pair of trays holding a master dental  
9 model cast and an opposing dental model cast,

10          b. releasably attaching each of said trays holding master and dental model casts to  
11 a separate one of said receptacles,

12          c. releasably attaching each of said receptacles to a separate one of an upper and  
13 lower arm of a three-dimensional dental model laboratory articulator apparatus,

14          d. effecting relative movement between said arms of said articulator to confirm proper  
15 occlusal relationship between a dental prosthesis fabricated from at least one of said dental  
16 model casts,

17          e. removing said receptacles from said arms of said articulator,

18          f. removing said dental model casts and prostheses from said receptacles, and

19          g. attaching together said dental model trays holding said dental model casts and  
20 said prosthesis by a hinge coupler which enables said master and opposing dental model casts  
21 to be pivoted towards and away from one another, whereby occlusion of said dental models and  
22 prosthesis may be viewed without requiring use of said articulator.

23      49. The method of Claim 48 wherein said receptacle slidably receives said dental model tray.

24      50. The method of Claim 49 wherein said attaching of said receptacle to said articulator arms  
25 employs means which enable a receptacle to be repeatedly attached to and removed from said  
26 articulator arm at a precisely repeatable location.

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1 51. The method of Claim 50 wherein said means enabling repeated removal and re-  
2 attachment of said receptacle at a precisely repeatable location of said articulator arm is further  
3 defined as including magnetically attachable means on said receptacle and said articulator arm.

4 52. In a dental modeling tray for molding dental models, the improvement comprising  
5 providing at least one protuberance which protrudes upwardly into an upper well portion of said  
6 tray adapted to receive molding material, whereby a dental model molded from molding material  
7 introduced into said well has formed in a base portion of said cast an upwardly protruding  
8 indentation having a shape complementary to that of said protuberance, said indentation being  
9 of an appropriate size and shape to serve as a pilot indentation for guiding into said base a point  
10 of a drill bit used to form in said base a bore for receiving a manipulating pin.

11 53. The improvement of Claim 52 wherein said protuberance is located generally midway  
12 between longitudinally disposed sides of said upper well.

13 54. The improvement of Claim 53 wherein said protuberance is further defined as being a  
14 longitudinally elongated rib which is parallel to said longitudinally disposed sides of said upper  
15 well.

16 55. In a method for molding dental models, the improvement comprising molding into a base  
17 of said model an indentation of an appropriate size and shape to serve as a pilot indentation for  
18 guiding into said base a point of a drill bit used to form in said base a bore for receiving a  
19 manipulating pin.

20 56. The improvement of Claim 55 wherein said protuberance is located generally midway  
21 between longitudinally disposed sides of said upper well.

22 57. The improvement of Claim 56 wherein said protuberance is further defined as being a  
23 longitudinally elongated rib which is parallel to said longitudinally disposed sides of said upper  
24 well.

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